§9. Set up of the 3rd Solid-state Power Supply System of ECH

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According to the original scenario of LHD-ECH system, and to increase EC-heating power, one more solid-state power supply (SSPS) system for gyrotron operation was enabled to be used for LHD experiment.

A SSPS system had been installed at plasma heating laboratories and used for R & D of components of ECH system such as gyrotron development, gyrotron aging, power transmission test, and so on. The SSPS system was moved to heating power supply building and heating power equipment room of LHD building. Also a super conducting magnet and its PS, gyrotron tank were moved to the heating power equipment room.

For gyrotron operation, both of high voltage PS (~90kV) and low voltage PS are necessary. With the set up of the 3rd high voltage PS system, two 3ϕ-200V and one 1ϕ-100V AC power distributor panels were prepared in the heating power equipment room.

A SSPS system consists of a collector PS (65kV, 126A in pulse mode, 42A in CW mode), a body PS (90kV, 100mA), an anode PS (50kV, 50mA), a heater PS, their respective control units, and a control panel. The collector PS consists of a thyristor, a transformer rectifier, DC filter, GTO (gate turn off) switch, DC reactor, etc. The GTO switch is a solid-state semiconductor switch and it is characteristic for SSPS.

During the 1st and 2nd cycles of the LHD experiment, three PS systems were used to operate gyrotrons for the experiment and for aging. One is a conventional PS with series tube regulation and the other two SSPS. Each component of the moved 3rd SSPS system was installed with the same way as existed SSPS systems. The thyristor and the transformer rectifier were installed in the heating power supply building and the other ones in the heating power equipment room.

The moving and installation of the 3rd SSPS system were begun in Jan. 1999 and have been finished successfully by the middle of March. All the checking tests (interlock, sending and getting control signals, high voltage output, etc.) could not find any trouble on the system.

Now a 168 GHz gyrotron tube was connected to the 3rd SSPS system and has been operated under aging. Both the gyrotrons under aging and the 3rd SSPS system will contribute to the future experimental periods of LHD project.